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Russell

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[54] **TIMING BELT GRINDING APPARATUS AND METHOD**

[76] Inventor: **Jerry Russell**, 95 Windsor Rd., Rochester, Mich. 48307

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[22] Filed: **Sep. 22, 1995**

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[51] **Int. Cl.**^{7} **B24B 53/00**

[52] **U.S. Cl.** **451/189**; 451/242; 451/541; 451/545; 451/547

[58] **Field of Search** 451/28, 131, 136, 451/140, 150, 182, 184, 188, 189, 242, 246, 249, 540, 541, 545, 546, 547, 233; 83/875, 876, 878, 862; 156/138, 142; 264/162

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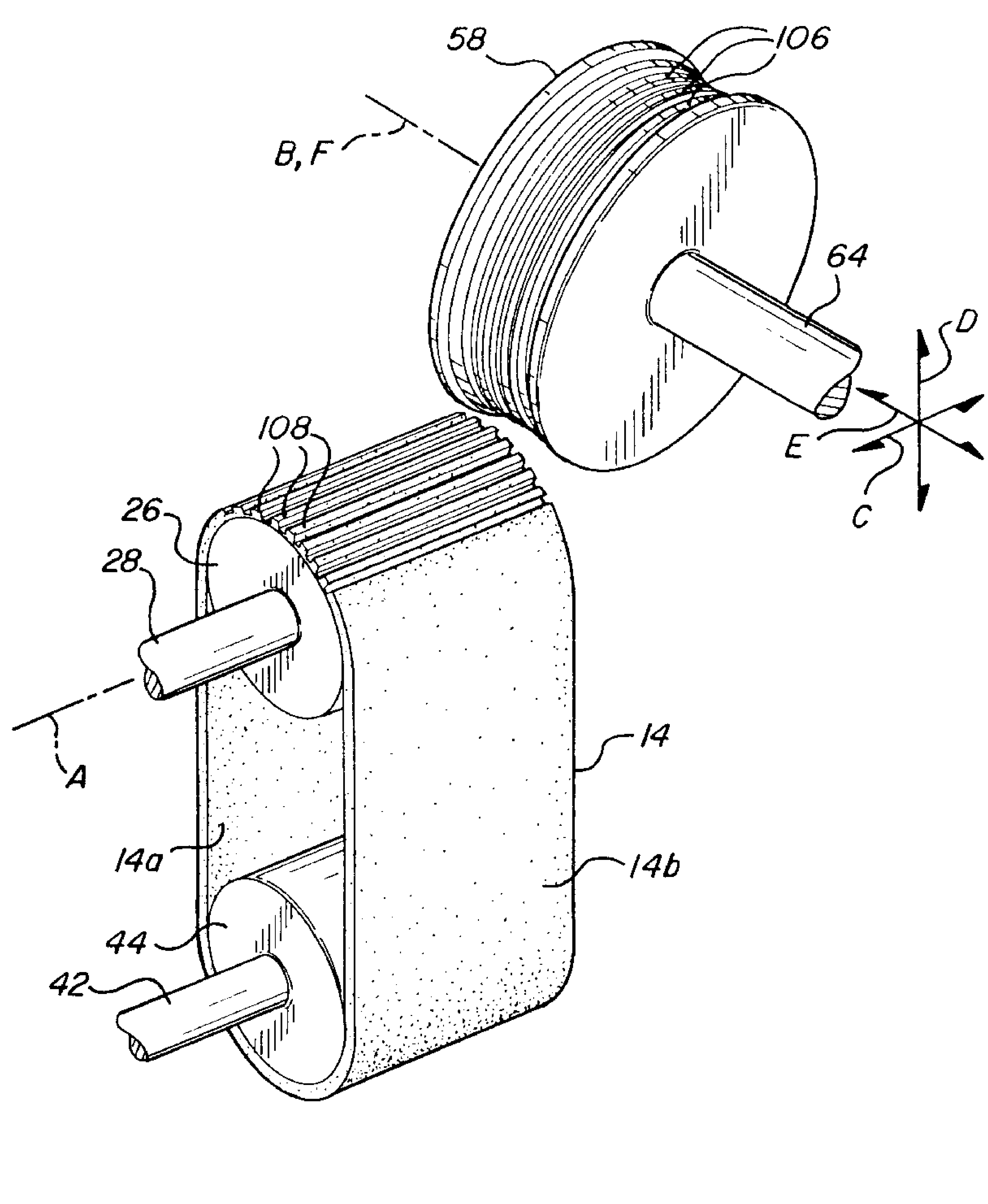
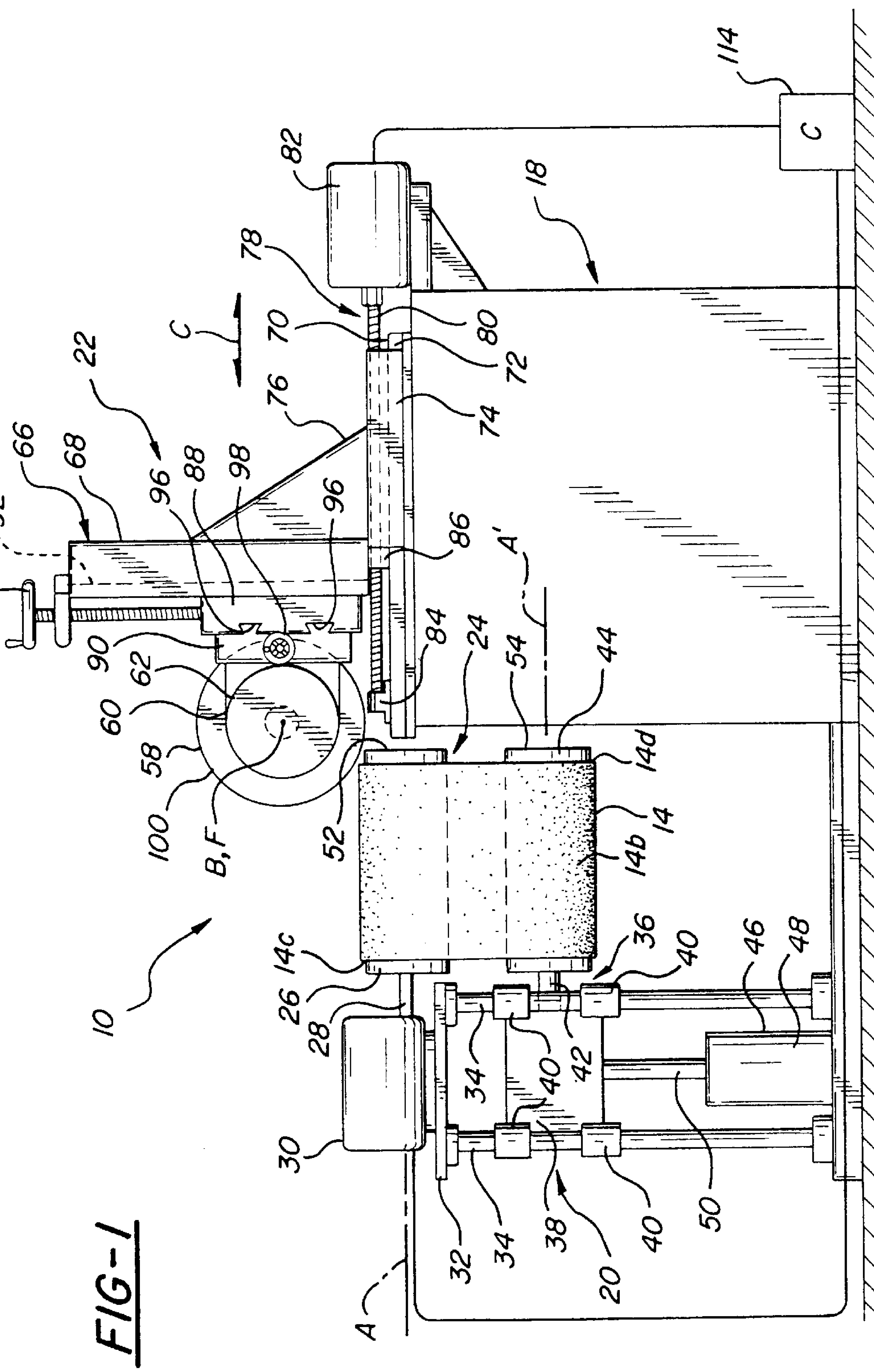
Primary Examiner—Eileen P. Morgan

[57] **ABSTRACT**

A toothed timing belt is produced from a belt blank utilizing an apparatus having a belt blank fixturing device for supporting the belt blank for selective indexable rotation about a first axis and a toothed grinding wheel rotatable about a second transverse axis and supported for movement across the width of the belt blank in a direction parallel to the first axis for cutting a series of circumferentially spaced transverse teeth into the belt blank. The belt blank is indexed with each pass of the grinding wheel until the entire belt has been provided with teeth. The toothed belt blank may then be severed about its periphery to provide a plurality of discrete timing belt members.

4 Claims, 4 Drawing Sheets

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66
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74
76
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88
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92
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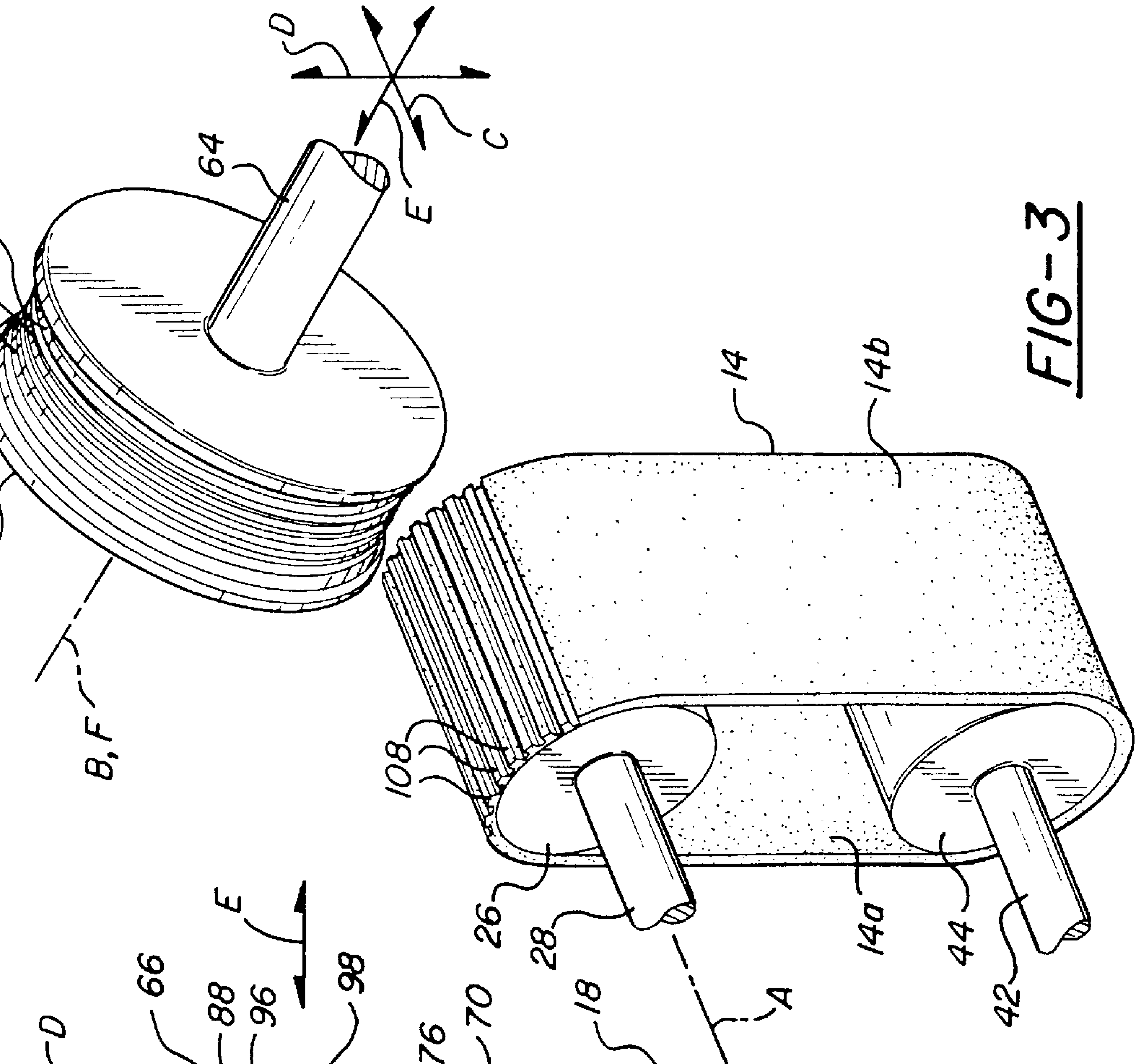
98
100
114
A
A'
B,F
C

FIG-1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14a
44
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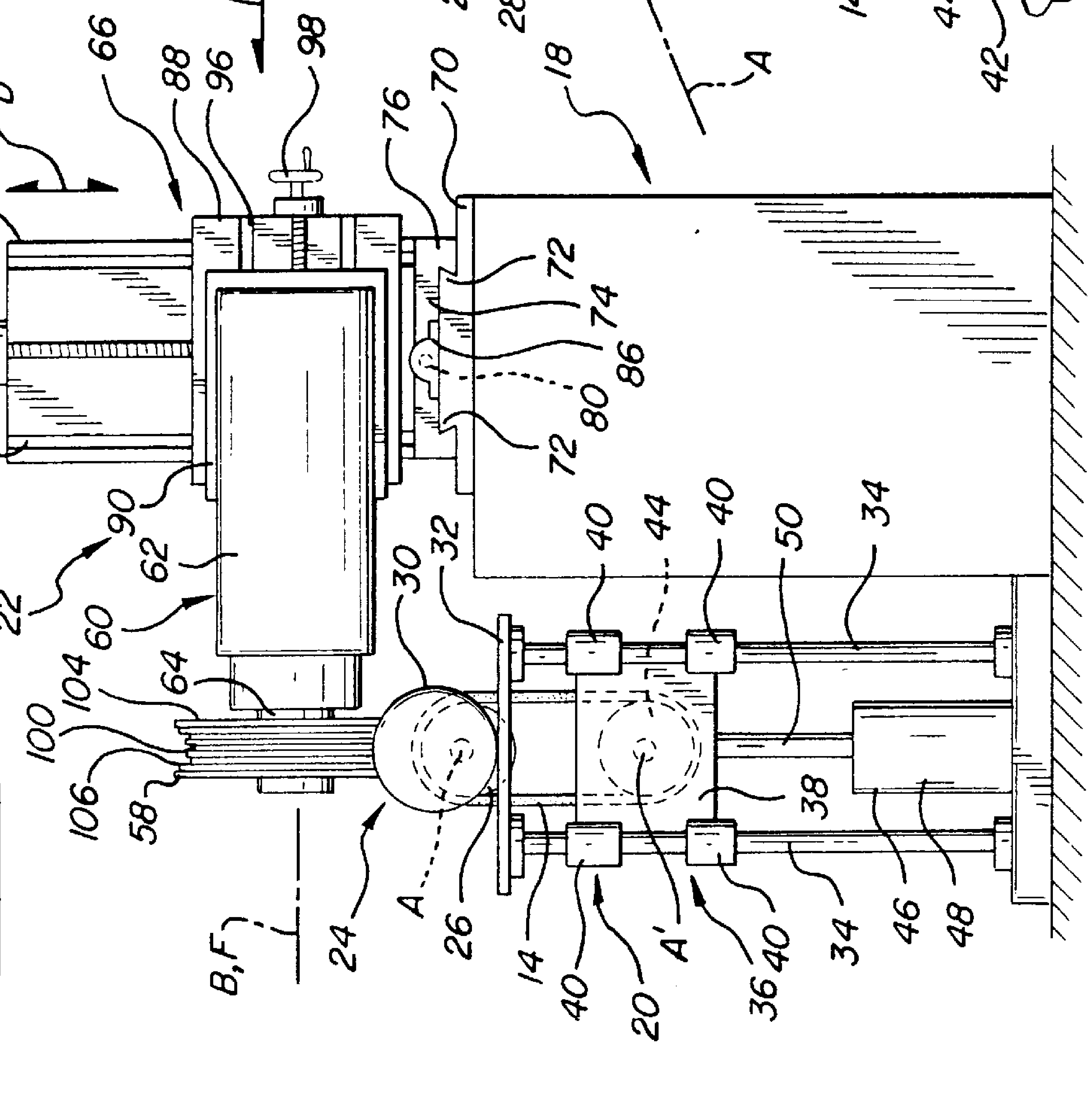
A

FIG-3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64
100
106
58
30
32
40
44
40
50
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38
24
26
A
B,F
14
40
20
A'
36
40
34
46
48

FIG-2

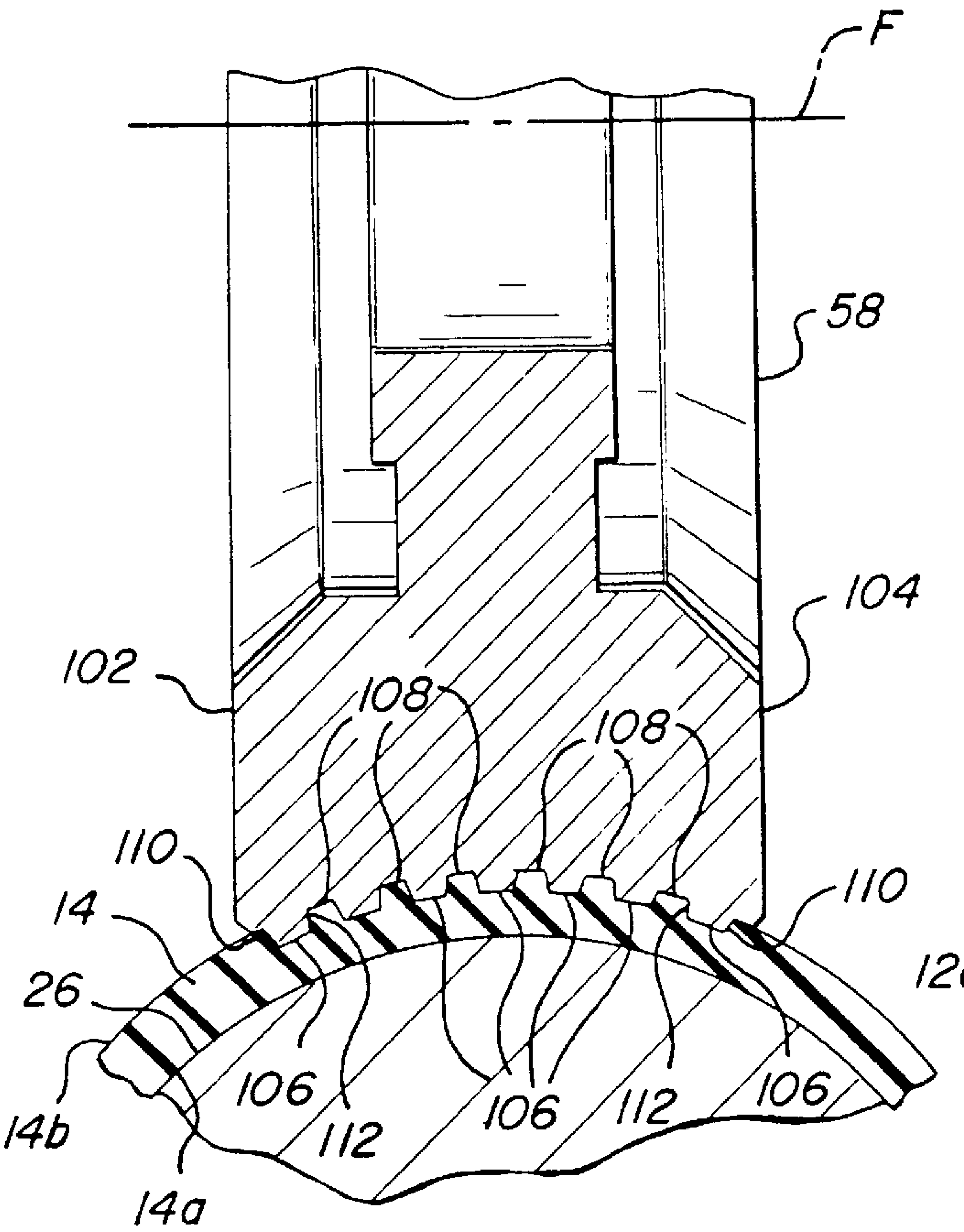


FIG-4

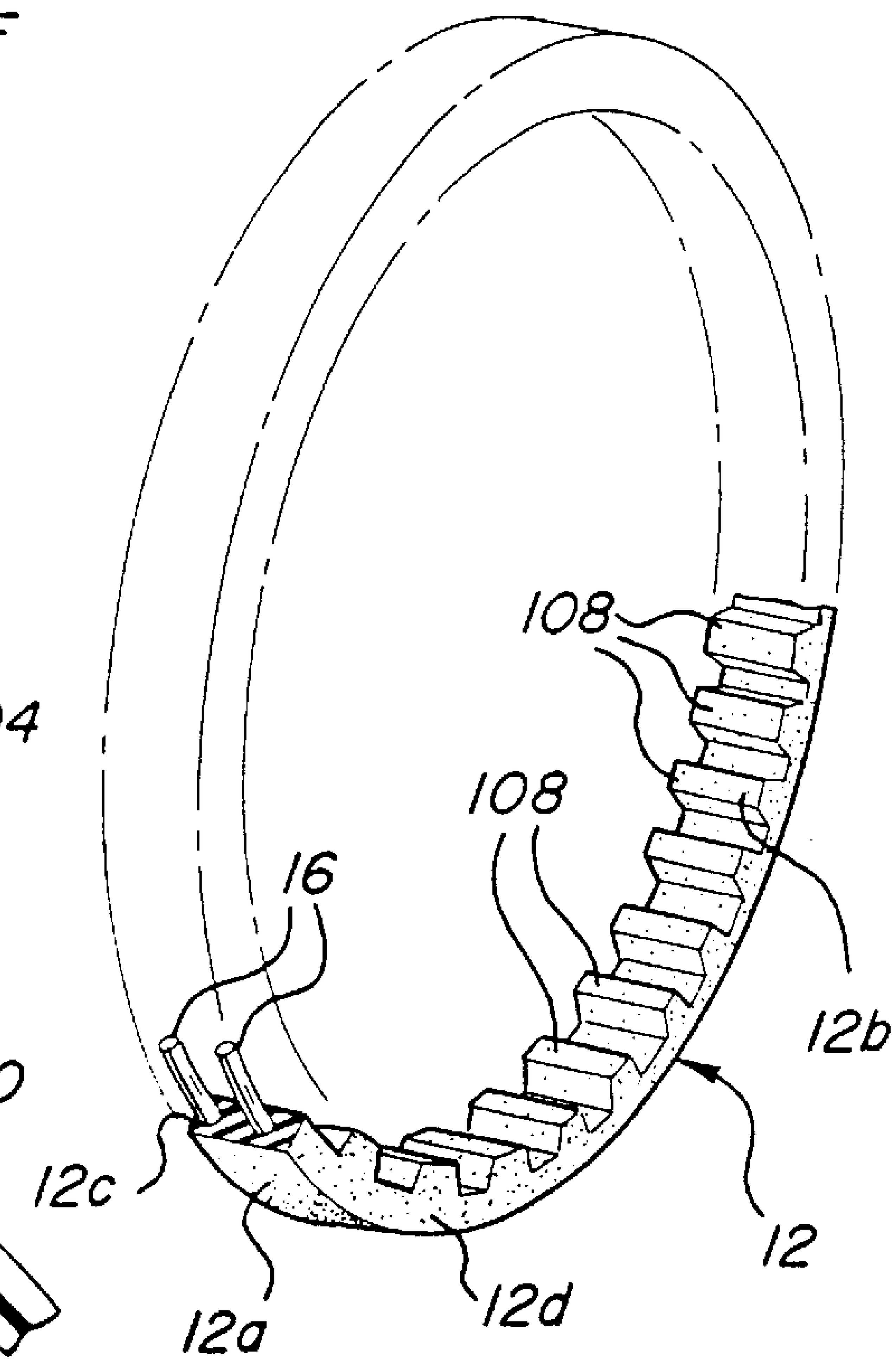


FIG-5

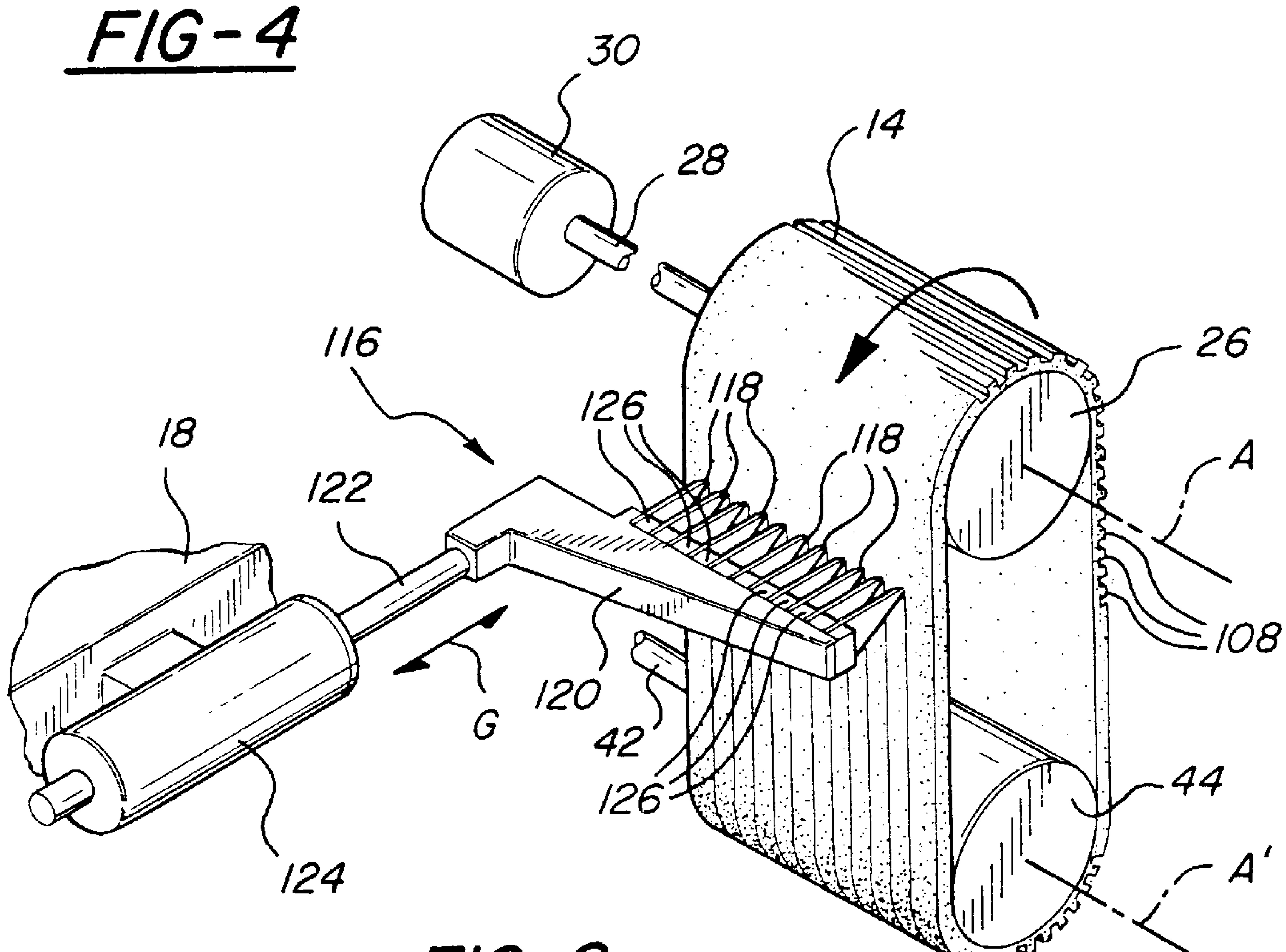
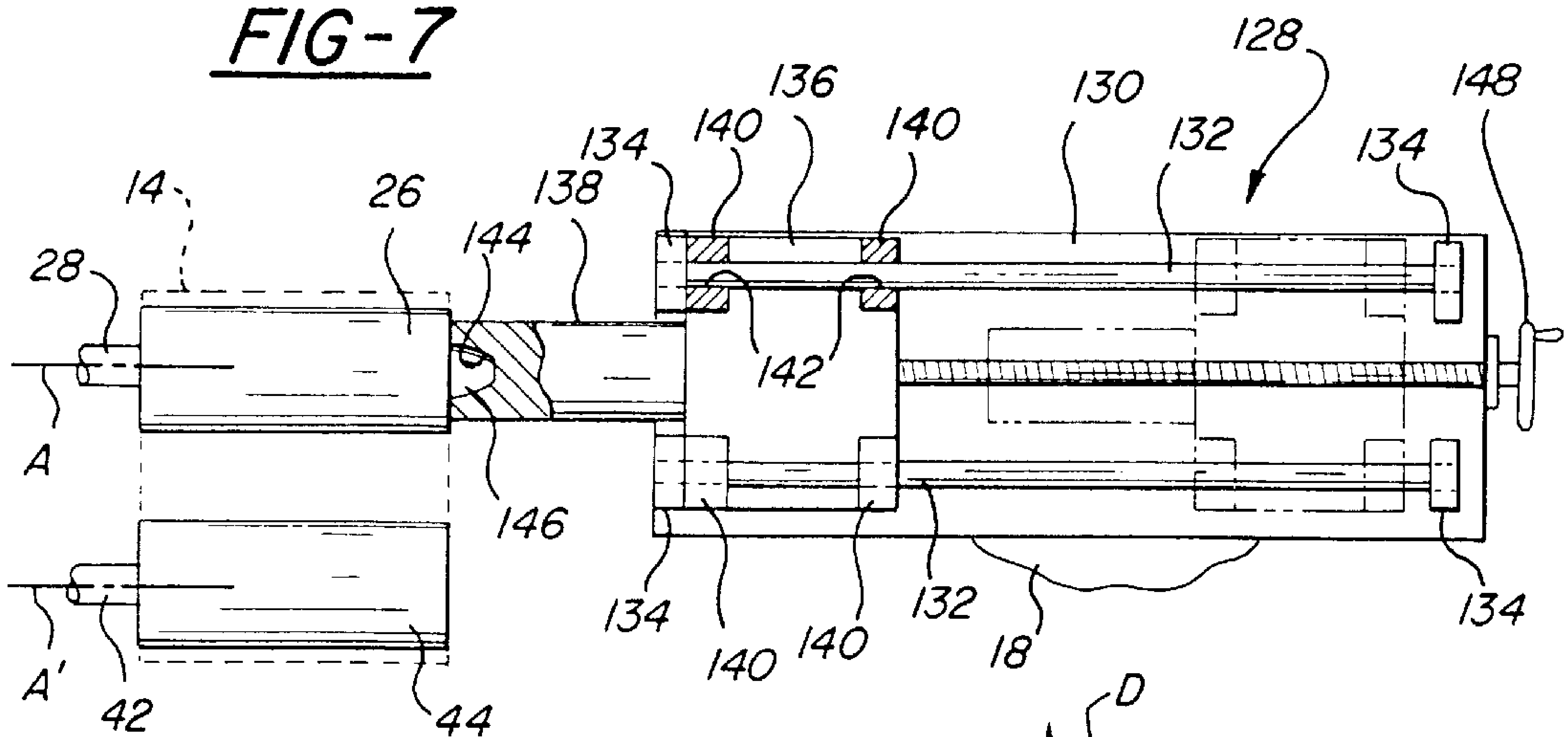


FIG-6

FIG-7



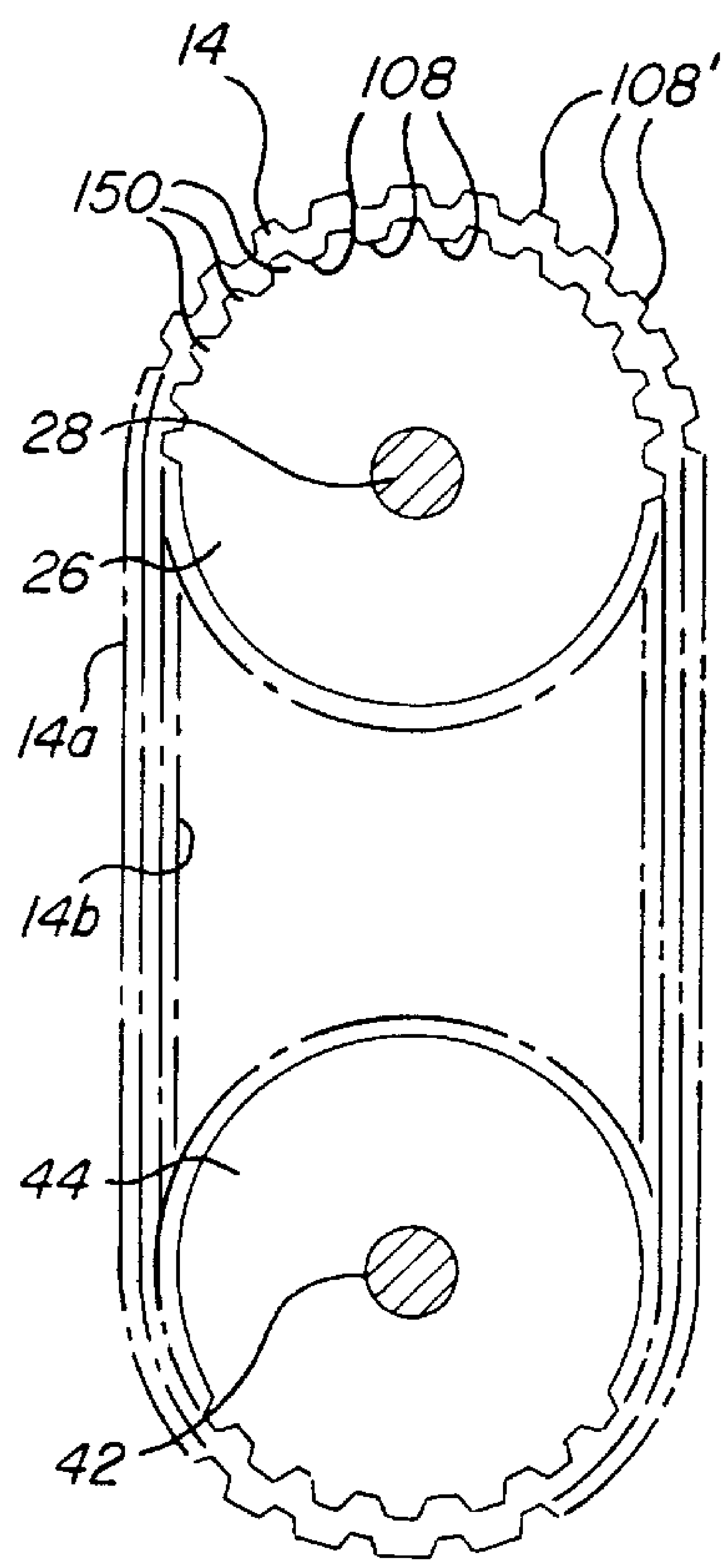


FIG-8

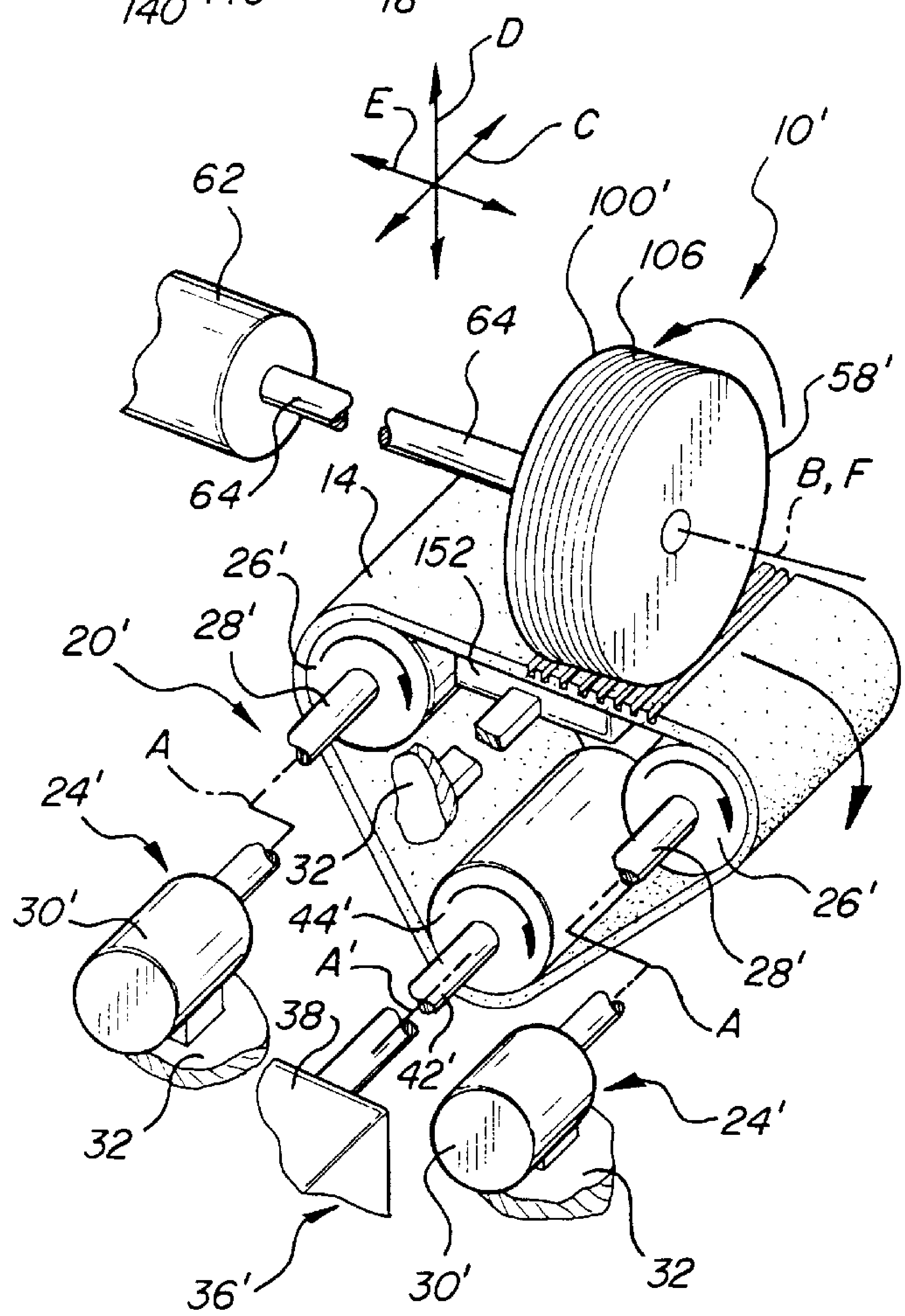


FIG-9

TIMING BELT GRINDING APPARATUS AND METHOD

This is a division of application Ser. No. 08/251,024 filed May 31, 1994, now U.S. Pat. No. 5,486,133.

TECHNICAL FIELD

This invention relates to methods and apparatus for producing timing belts.

BACKGROUND OF THE INVENTION

Power transmitting toothed belts, also known as timing belts, are used for many applications, like driving an engine's camshaft off the crankshaft. The teeth of the belt mesh with corresponding teeth on pulleys mounted the shaft members to prevent slippage and provide synchronized rotation of the driven shaft member (e.g. camshaft) with respect to the driving shaft member (e.g. crankshaft). Such timing belts are lighter in weight than metal power transmission chains and are able to be used in applications requiring the use of small pulleys having small arcs of contact with the belt. At present, however, such timing belts are costly to produce which is believed in part to be attributed to the present process used to manufacture the timing belts namely molding.

SUMMARY OF THE INVENTION AND ADVANTAGES

Apparatus for cutting teeth into an endless belt blank to produce a timing belt comprises belt support means for supporting the endless blank for selective rotation about a first axis, a cutting wheel having a plurality of peripheral tooth cutting portions spaced laterally from one another, and wheel rotation means for rotating the wheel about a second axis that is transverse to the first axis and translating means for translating the wheel relative to said belt support means across the width of the belt blank along a path generally parallel to the first axis for cutting a plurality of transverse teeth into the belt blank with the tooth cutting portions.

According to another aspect of the invention, a grinding wheel construction for cutting teeth into a belt blank to produce a timing belt comprises a wheel having an axis of rotation and an abrasive peripheral grinding surface of predetermined width, wherein the grinding surface has a concave profile across its width and a plurality of laterally spaced grinding ribs extending circumferentially about the periphery of the grinding surface.

According to yet another aspect of the invention, a method of producing a timing belt comprises the steps of: (a) supporting a belt blank about a first axis with a peripheral surface of the belt blank disposed outwardly; (b) rotating the cutting wheel about a second axis that is transverse to the first axis and translating the wheel along a path and across the outwardly disposed peripheral surface to thereby cut a plurality of teeth into the belt blank extending across the width of the belt in circumferentially spaced relation to one another; (c) indexing the belt blank rotatably about the first axis to bring another uncut portion of the belt blank into the cutting path of the wheel; and (d) repeating steps (c) and (d) until the entire outwardly disposed periphery of the belt blank has been provided with teeth.

The invention enables timing belts to be produced from uncut belt blank stock by cutting the teeth into the belt blank stock to produce the timing belts, at a recognized cost, time, and labor savings over the presently molded timing belts.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of this invention will become more readily understood and appreciated by those skilled in the art when considered in connection with the following detailed description and drawings, wherein:

FIG. **1** is a front elevation view of the belt grinding apparatus;

FIG. **2** is a side elevation view of the belt grinding apparatus;

FIG. **3** is an enlarged fragmentary perspective view of a portion of the apparatus;

FIG. **4** is an enlarged fragmentary sectional view of the grinding wheel, belt, and belt support mandrel;

FIG. **5** is a fragmentary perspective view of a timing belt produced by the present invention;

FIG. **6** is a fragmentary perspective view illustrating the optional belt cutting device;

FIG. **7** is a fragmentary front elevation view, shown partly in section, illustrating the optional mandrel support device;

FIG. **8** is an enlarged fragmentary side elevation view of alternative belt support and tensioning mandrels for use with the apparatus of FIGS. **1** and **2**; and

FIG. **9** is a fragmentary perspective view of an alternative belt support and tensioning system for supporting the belt blank during grinding.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A belt grinding apparatus, constructed according to a presently preferred embodiment of the invention is designated generally at **10** in the drawings and is shown as being adapted for use in producing one or more toothed belts (also known as a timing belt) **12** from an endless flexible belt blank **14**. The belt blank material from which the timing belts are produced may be of the type having a rubber core or other suitable material conventionally used for timing belts and embedded in which may be one or more tension carrying cords **16** provided to minimize stretching of the belt during use. The belt blank **14** has opposing peripheral surfaces **14***a*, **14***b* corresponding to peripheral surfaces **12***a*, **12***b* of the timing belts **12**. The peripheral surfaces extend about the circumference of the belt blank **14**, and timing belts **12**, respectfully, and laterally across their respective widths between opposite side edges **14***c*, **14***d*; **12***c*, **12***d*. The belt blank **14** is generally rectangular in transverse section and has a uniform thickness and a fixed circumferential length. The belt blank's width may be the same as that of the timing belt **12** or it may have a width selected to be wider than a single timing belt **12** for producing multiple relatively narrower timing belts **12** from a single belt blank **14**, as will be described in greater detail below.

The apparatus **10** has a base **18** mounting a belt blank fixturing device **20** and a belt blank tooth cutting device **22**. The belt blank fixturing device **20** includes belt blank support means **24** having a cylindrical drive mandrel or drum **26** which may be detachably mounted to a work spindle **28** of an indexable stepper-driven rotary drive motor **30**. The motor **30** is operative for selectively rotating the mandrel **26** about a first axis of rotation A in an indexible or continuous manner, as will be described further below. The motor **30** is mounted on an elevated platform **32** supported above the base **18** by four vertical rigid posts **34** projecting upwardly from the base **18**.

The belt blank fixturing device **20** also includes belt tensioning means **36** for tensioning the belt blank **14** while supported by the belt support means **24**. The belt tensioning means **36** comprises a shuttle or carriage **38** coupled slidably to the posts **34** via four coupling blocks **40** for vertical movement normal to the rotation axis A toward and away from the mandrel **26** or readily available conventional slide assembly. The carriage **38** supports a horizontally extending rotary shaft **42**. A cylindrical tensioning mandrel or roller **44** is journaled on the shaft **42** and is freely rotatable about an axis A' of the shaft **42** that is parallel to the rotation axis A and movable with the carriage **38** laterally toward and away from the drive mandrel **26**. A double acting-type fluid cylinder or equivalent device, such as a motor-driven screw **46** is provided for positioning and holding the carriage **38** and tensioning mandrel **44** in any one of a number of positions of vertical adjustment along the posts **34**. The double acting fluid cylinder **46** comprises a cylinder body **48** mounted on the base **18** beneath the carriage **38** centrally between the posts **34**. A vertical extension shaft **50** has an upper end secured to the bottom of the carriage **38** and includes a piston (not shown) adjacent its lower end slidably disposed within an internal chamber (not shown) of the cylinder body **48**. Pressurized fluid (e.g. hydraulic fluid under pressure) may be introduced into the chamber either below or above the piston in conventional manner to raise or lower the vertical positioning of the carriage **38**, respectively.

The mandrels **26** and **44** have corresponding free ends **52** and **54**, respectively, that are unencumbered so as to enable the endless belt blank **14** to be slid onto the mandrels **26, 44** over their free ends **52,54**. Once the belt blank **14** is positioned over the mandrels **26, 44**, the belt tensioning means **36** is operated to move the tensioning mandrel **44** downwardly away from the drive mandrel **26** to thereby engage the inwardly disposed peripheral surface **14***a* of the belt blank and apply sufficient tension to the belt blank **14** to prevent it from slipping off the mandrels **26** and **44** during the subsequent belt cutting operation.

The belt blank tooth cutting device **22** includes a cutting or grinding wheel **58** and wheel rotation means **60** mounting the wheel **58** for rotation about a second axis B that is transverse and preferably perpendicular to the first rotation axis A of the drive mandrel **26** about which the belt blank **14** rotates. The wheel rotation means **60** comprises an electric drive motor **62** having a rotary drive spindle **64** extending horizontally along the second axis B and detachably mounting the grinding wheel **58** for rotation with the spindle **64** about the axis B. The motor **62** is supported by translation means **66** for selectively translating or moving the wheel **58** along a cutting path in the direction of double-headed arrow C that is generally parallel to the first axis A of the belt drive mandrel **26**.

As shown best in FIGS. **1** and **2**, the translation means **66** may comprise a compound three axis way slide assembly **68** supported by the base **18**. The way slide assembly **68** includes a primary longitudinal way slide base track **70** secured to the base **18** having linear guide tracks **72** extending in the direction of the cutting path and slidably supporting guided portions **74** of a carriage **76** for movement therealong. A screw drive device **78** or a double acting type fluid cylinder or equivalent device is provided for driving the carriage **76** along the track **70** to move the grinding wheel **58** back and forth along the cutting path. The screw drive device **78** includes a lead screw **80** coupled at one end to a drive motor **82** and supported for rotation at an opposite end by a support block **84** mounted on the base **18**. The carriage **76** has a drive nut **86** secured thereto provided with internal screw threads meshing with the threads of the lead screw **80** such that on rotation of the lead screw **80** the nut **86** and hence the carriage **76** is caused to travel in one direction along the length of the lead screw **80**, and travel in the opposite direction when rotation of the lead screw **80** is reversed. The motor **82** is preferably a conventional reversible electric motor.

The compound way slide assembly includes additional vertical and lateral slide portions **88** and **90**, respectively, to provide additional vertical and lateral adjustment capability to the position of the wheel **58** relative to the axis of rotation A in the direction of double-headed arrows D and E (FIG. **2**), respectively. The compound way slide assembly **68** thus provides three axis movement to the wheel **58**. The vertical slide **88** is supported by vertical guide tracks **92** mounted on the carriage **76** for vertical sliding movement therealong. A manual screw drive device **94** or motorized, or double acting-type fluid cylinder or equivalent device is provided for adjusting the vertical position of the slide **88** along guide track **92** in the direction of arrows D. The lateral slide **90** is slidable along lateral guide tracks **96** provided in vertical slide **88** for horizontal lateral movement therealong perpendicular to the rotation axis A in the direction of arrows E. A similar manual screw drive device **98** or motorized, or double acting-type fluid cylinder or equivalent device is supported on the vertical slide **88** and operatively coupled to the lateral slide **90** for adjusting the lateral positioning of the slide **90** along guide tracks **96**.

The grinding wheel **58** is generally cylindrical in configuration and provided with an abrasive outer peripheral grinding surface **100**. The wheel **60** has a central axis F extending along the second axis B when the wheel **58** is mounted on the drive spindle **64**. The grinding surface **100** extends across the width of the wheel **58** between opposite parallel ends **102** and **104** of the wheel **58** that are normal to the axis F. The grinding wheel **58** may comprise an abrasive wheel wherein at least the grinding surface **100** is fabricated of abrasive particulate material. As shown best in FIG. **4**, the grinding surface **100** is provided with a plurality of tooth cutting portions or grinding teeth in the preferred form of radially outwardly projecting annular grinding ribs **106** extending about the circumference of the grinding surface **100** and spaced laterally from one another across the width of the wheel **58** for removing waste material from the outer peripheral surface of the belt blank **14** to provide a corresponding plurality of teeth **108** in the belt blank **14** and hence the timing belt **12**.

Each of the grinding ribs **106** have lateral outer and inner side faces **110, 112** that are inclined relatively toward one another in the radially outward direction of the ribs **106** to provide a taper to each rib **106** and a corresponding inverse taper to the belt teeth **108**.

As also seen best in FIG. **4**, the grinding surface **100** has an enveloping or concave transverse profile across the width of the grinding surface **100** such that the grinding ribs **106** are disposed along an inwardly curving arc that is selected to correspond in curvature substantially to that of the outer peripheral surface portion of the belt blank **14** wrapped around and directly engaging the drive mandrel **26**. In this way, the mandrel **26** underlies and supports the portion of the belt blank **14** being cut by the wheel **58**. The number of grinding ribs **106** that may be provided for a given width wheel is governed in part by the concave curvature of the grinding surface **100,** in that the angle of the laterally innermost side face **112** of the two outermost grinding ribs **106** may not be inclined inwardly beyond vertical or else the belt blank **14** would be undercut by that portion of the ribs. In other words, the aforementioned inner side faces **112** may incline outwardly toward the respective adjacent ends **102** and **104** of the wheel **58** or may be parallel to the ends **102**, **104**, but may not angle toward one another away from the adjacent ends **102**, **104**.

To produce a timing belt **12** like the one illustrated in FIG. **5**, the belt blank **14** is supported by the belt blank fixturing device **20** by sliding the belt blank **14** over the free ends **52**, **54** of the mandrels **26**, **44** and operating the belt tensioning means **36** to slide the tensioning mandrel **44** downwardly away from the drive mandrel **26** such that the inwardly disposed peripheral surface **14***a* of the belt blank **14** is engaged by each of the mandrels **26** and **44** and the belt blank **14** is being taut between the mandrels **26**, **44**, as illustrated in FIGS. **1**–**2**. When supported by the fixturing device **20**, a portion of the belt blank **14** wraps around and directly engages the drive mandrel **26**, as illustrated in FIG. **4**, such that the outwardly disposed peripheral surface **14***b* of the belt blank **14** is supported in an arc, as shown.

Once the belt blank **14** is supported in the fixturing device **20**, appropriate adjustments are made to the lateral and vertical slide members **90**, **88** to position the grinding wheel **58** relative to the belt blank **14** and belt blank fixturing device **20** such that the axis A lies in the central plane of the grinding wheel **58** and the grinding surface **100** positioned vertically as in FIG. **4** so as to engage the outwardly disposed peripheral surface **14***b* of the belt blank **14** with the grinding surface **100** of the wheel **58** when moved relatively across one another.

Once the appropriate vertical and lateral adjustments have been made to the position of the grinding wheel **58**, the motor **82** is operated to translate the rotating grinding wheel **58** in the direction of arrow C across the width of the belt blank **14** to thereby cause the grinding ribs **106** to grind away and remove waste material from the peripheral surface **14***a* of the belt blank **14** producing the teeth **108** that extend across the width of the belt blank **14** and are spaced laterally from one another in the direction of the circumference of the belt blank. Once the grinding wheel **58** has made a pass across the width of the belt blank **14**, the mandrel drive motor **30** is operated to index the belt blank **14** rotatably about the axis A to bring a next successive uncut portion of the belt blank **14** into the path of the grinding wheel **58**, after which the motor **82** is operated to again translate the grinding wheel **58** across the width of the belt to produce another successive set of teeth **108**. The indexing and translating steps are repeated until the entire outer peripheral surface of the belt blank **14** has been provided with such teeth **108**. The indexing and translating operations are timed in relation to one another may be controlled manually or under the control of a suitable programmable controller **114**.

Once the teeth **108** have been cut into the belt blank **14**, the belt blank **14** may be further cut along its peripheral length entirely about the circumference of the belt blank at a plurality of laterally spaced locations, as illustrated in FIG. **6**, by suitable cutting means **116** to sever the belt blank **14** into a plurality of discrete individual timing belt members **12**, each having a width relatively narrower than that of the belt blank **14**. As shown by way of example in FIG. **6**, the belt blank **14** is cut into **12** individual timing belt members.

The cutting means **116** comprises a plurality of cutting knives **118** mounted on an arm **120** and spaced laterally from one another by spacer blocks **126** provided between each adjacent pair of knives **118** corresponding in width to the width of the timing belt members to be formed. The number and spacing of the knives **118** may be varied by usage of different size spacer blocks to obtain the desired width of the timing belt members **12**. The arm **120** is in turn attached to an actuating device such as to an extension shaft **122** of a fluid cylinder actuator **124** mounted on the base **18** and operable for moving the knives **118** into and out of contact with the belt blank **14** along double headed arrow G.

To utilize the cutting means **116**, the motor **30** is operated to rotate the drive mandrel **26** and hence the belt blank **14** continuously and at a high rate of speed. The fluid cylinder actuator **124** also is operated to extend the spaced apart cutting knives **118** into cutting engagement with the rotating belt blank **14** to cut the blank **14** into the individual timing belt members **12**. The motor **30** is thus indexable to enable incremental rotation of the belt during the tooth cutting operation and also continuously rotatable at a relatively higher rate of speed to assist in the severing operation of the belt blank **14** into the individual timing belt members **12**.

After the teeth **108** have been cut into the belt blank **14** and the belt blank **14** severed into the individual timing belt members **12**, the timing belt members **12** are removed from the belt fixturing device **20** by raising the belt tensioning mandrel **44** to relieve tension on the belt members **12** and sliding the belt members **12** off the mandrels **26**, **44** after which the belt members **44** may be inverted so that the teeth **108** face inwardly, as illustrated in FIG. **5**.

FIG. **7** illustrates mandrel support means **128** that may be utilized to provide additional support to the drive mandrel **26**. As illustrated in FIG. **1**, the drive mandrel **26** is supported at one end by the spindle **28** of the drive motor **30**, however, its opposite end is unsupported. In applications where the belt blank **14** is fairly narrow in width, the support provided by the spindle **28** may be sufficient. However, if a very wide belt blank **14** (and hence a correspondingly wide mandrel **26**) is to be supported, it may be necessary to provide additional support to the free end **52** of the mandrel **26** to further support and stabilize the mandrel **26** during the tooth cutting and belt severing operations.

The mandrel support means **128** comprises an elongate support frame or bed **130** secured to the base **18** of the apparatus **10** and including a pair of longitudinal tracks **132** supported above the bed **130** by mounting blocks **134** and extending parallel to one another in the rotation axis A of the mandrel **26**. A shuttle carriage **136** having a mandrel engaging portion **138** is supported for sliding movement along the tracks **132** by support blocks **140**. The blocks **140** are secured to the shuttle carriage **136** and have aligned openings **142** through which the tracks **132** extend to couple the carriage **136** slidably to the tracks **132**. The mandrel engaging portion **138** is provided with a recess **144** in a free end of the portion **138** for receiving a correspondingly shaped projection **146** provided on the free end **52** of the mandrel **26** to thereby provide support to the free end of the mandrel **26**.

Means are provided for moving the carriage **136** between a disengaged position in which the mandrel engaging portion **138** is retracted and spaced from the free end of the mandrel **26** (broken chain lines in FIG. **7**), and a mandrel supporting position (said lines in FIG. **7**) in which the mandrel engaging portion **138** is extended toward and into engagement with the mandrel **26** such that the projection **146** is received within the recess **144**, as illustrated. The means for moving the carriage **136** along the tracks **132** may comprise a manual screw drive device **148** or motor driven or hydraulically or pneumatic actuated equivalent device of the same general type as those employed for controlling movements of the compound way slide components **68** described above.

In use, the belt blank **14** is slid over the free ends **52**, **54** of the mandrels **26** and **44** in the same manner as described previously, and the carriage **136** thereafter moved into the mandrel engaging position to support the free end of the drive mandrel **26**. The reverse operations are performed to remove the belt blank **14** from the mandrels **26, 44**.

FIG. **8** illustrates an alternative mandrel design in which the drive mandrel **26** and tensioning mandrel **44** are provided with external teeth **150** circumferentially spaced above the outer periphery of the mandrels and extending across their respective widths. The teeth **150** are configured to mesh with the teeth **108** cut into the belt blank **14** after the belt blank **14** has been inverted, such that the teeth **108** project inwardly, as illustrated in FIG. **8**. Supporting the belt blank **14** in the inverted manner positions the opposing uncut peripheral surface **14***a* of the belt blank **14** on the outer periphery of the belt blank **14** enabling additional transverse teeth **108**' to be cut, if desired, into the peripheral surface **14***a* of the belt blank in the same manner as that described previously for the cutting of teeth into the first peripheral surface **14***b*. The result is a belt blank **14** having transverse circumferentially spaced teeth **108** and **108**' provided on opposite respective surfaces **14***b*, **14***a* of the belt blank **14**. The belt blank **14** may be severed into individual timing belt members **12** in the same manner as previously described.

FIG. **9** shows an alternative embodiment of the apparatus designated generally at **10**' in which an alternative grinding wheel configuration **58**' mounted on the same motor driven spindle **64**, which is in turn supported by the same wheel translation means **66** and base **18** as that described previously to provide rotary movement to the wheel as well as translational movement in the directions of double headed arrows C, D, and E. The grinding wheel **58**' is similarly provided with a plurality of circumferentially extending laterally spaced grinding ribs **106** of the same general configuration as those described previously, however, the grinding surface **100**' is flat and generally parallel to the central axis F of the wheel **58**', rather than being concave in profile like the wheel **58**.

The belt blank fixturing device **20**' is similar in function but different in construction. The belt support means **24**' includes a pair of drive mandrels **26**' each mounted on a spindle **28**' of a pair of drive motors **30**' of the same indexable type as that described previously for the belt support means **24**. The motors **30**' are mounted on the platform **32** in laterally spaced horizontal relation to one another as shown in FIG. **9**.

The belt tensioning means **36**' comprises a tensioning or idler mandrel **44**' freely journaled about a shaft **42**' projecting from the carriage **38** and movable in the same vertical manner toward and away from the drive mandrels **26**' in the same manner as that of the tensioning mandrel **44** described previously.

The belt blank **14** is mounted on a fixturing device **20**' in similar fashion by sliding the belt blank **14** over free ends of the mandrels **26**' and **44**' and then lowering the tensioning mandrel **44** to engage and tension the belt blank **14** in the same manner.

A rigid support plate **152** is secured to the platform **32** and is disposed between the drive mandrels **26**', as illustrated in FIG. **9**. The support plate **152** engages and supports the inwardly disposed peripheral surface **14***a* of the belt blank **14**. The grinding wheel **58**' is translated across the width of the belt blank **14** along a guide path parallel to the rotation axes A of the drive mandrels **26**' and over the support plate **152** for cutting the transverse teeth **108** into the outwardly disposed peripheral surface **14***b* of the belt blank overlying the support plate **152**. In contrast to the first embodiment, the wheel **58**' passes between the drive mandrels **26**' to cut the teeth **108** into a flat portion of the belt blank **14** overlying the support plate **152**, rather than translating the wheel **58** directly over the mandrel **26** to cut the teeth **108** into an arcuately disposed portion of the belt blank **14** overlying the mandrel **26**. The first embodiment requires usage of a grinding wheel having described concavely shaped grinding surface **100** as opposed to the square profiled grinding surface **100**' utilized for the apparatus **10**'.

The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

Obviously, many modificaions and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims wherein reference numerals are merely for convenience and are not to be in any way limiting, the invention may be practiced otherwise than as specifically described.

I claim:

1. Grinding wheel construction for cutting teeth into a belt blank to produce a timing belt, said wheel construction comprising:

a wheel **(58)** having an axis of rotation (F) and an abrasive peripheral grinding surface **(100)** of predetermined width;

and characterized by said grinding surface **(100)** having a concave profile across said width and a plurality of radially projecting grinding ribs **(106)** extending circumferentially about the periphery of said grinding surface **(106)** and spaced laterally across the width of said grinding surface **(100)**.

2. The wheel construction of claim **1** further characterized by said grinding ribs **(106)** each having a pair of spaced lateral side faces **(110, 112)** inclined relatively toward one another in a radially outward direction of said wheel.

3. A grinding wheel for cutting teeth in a belt blank to produce a timing belt, said wheel comprising an outer peripheral grinding surface having a generally concave profile across the width of said grinding surface and including a plurality of circumferentially continuous grinding ribs spaced laterally across the width of said grinding surface.

4. A grinding wheel for cutting teeth in a belt blank to produce a timing belt, said wheel comprising an outer peripheral grinding surface having a generally concave profile across the width of said grinding surface and including a plurality of circumferentially continuous grinding ribs spaced laterally across the width of said grinding surface, said ribs having opposed side faces set at predetermined varying angles with respect to a central plane of said wheel to generate uniform teeth of the timing belt.

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